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COMPUTERS REVIEW REPORT

Review on Internet of Things

Linda Nur Afifa [1] and Tri Kuntoro Priyambodo [2]
[1] Darma Persada University, Jakarta, Indonesia, [2] Gadjah Mada University, Bulak Sumur, Indonesia
[1] linda_nur_afifa@unsada.ac.id , [2] mastri@ugm.ac.id

ABSTRACT

The Internet of things is not a new concept, many industries has been applied IoT for laveraging his bussiness and become an integral part of human life style. Hardware and software technology become important for IoT Implementation. These paper is constitutes result from review that will explained about everything wich related to IoT such as architecture, technology enabler, Iot Usage and some problem or challenge associated in IoT.

Keywords: IoT standard, energy harvesting, interoperablity, heterogeneity

1. INTRODUCTION

Internet of Things (IoT) refers to the connection of different detectable embedded computing-like device such as bulit-in sensor in automobile, heart monitoring implants, biochip transponders on farm animals [1]. Thousand of devices interact with other via wireless/wired communication without human intervention. In other research IoT defined as a novel technology with the help of which devices can communicate with each other using sensors [2]. IoT has been implemented in various sector shown in Fig. 1, to control many things that encounter in our daylife are vehicle, building, appliance, etc.

The number of things that are connected to the Internet is growing exponentially. IoT has been emerging as the next big thing in Internet. It is envisioned that billions of physical things or objects will be outfitted with different kinds of sensors and actuators and connected to the Internet via heterogeneous access networks [3]. According to Gartner in [2], there will be approximately 26 billion devices that might be on the Internet of Things by 2020. Repoted in other research, over 50 billion sensor- based devices will be connected to the internet and there will be, on average, 6.58 devices per person by 2020 [4]. Cisco conducted there are about 14 billion objects connected to the Internet, the otherwise industry analysts estimate the number of connected devices could be anywhere from 20 billion to 100 billion by 2020 [5].

The Research above gives many indication that the billion of things tobe interconnected and communicate trough a network that will generate thousand of data. There are also have vulnerabilities, for example malicious attack in device and network, addressing, power consuming, services, etc.

The rest of the paper organised as follow: section 1 mainly overview of IoT. In section 2, will be discussed about architecture and technology enabler. Example of IoT usage will be expalined in section 3. In section 4, the acknowledgement about IoT fraud, and the last section is discussion.

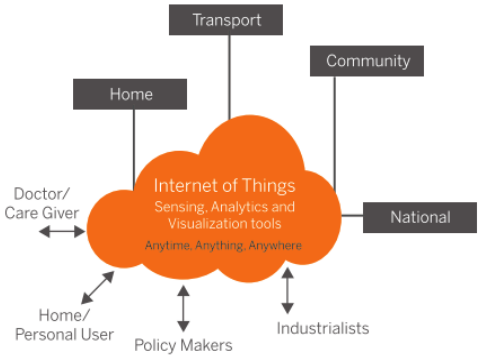

Figure 1.IoT Illustration

2. ARCHITECTURE AND TECHNOLOGY ENABLER

A. IoT Architecture

The one of problem is IoT architectur, that is a broad concept and there are no proposed for universal architecture. There are architecture standars have been issued by European FP7, International Telecommunication Union (ITU), IoT Forum, Qian Xiaocong, Zhang Jidong Architecture, Kun Han, Shurong Liu, Dacheng Zhang and Ying Han's (2012)'s Architecture [6]. Based on the rivew in variety of paper in [7] [8] , generally it's devided into six layers those are coding layer, perception layer, network layer, perception layer, network layer, middleware layer, application layer and bussiness layer. In any case architecture of IoT consisted of four layer those are sensing layer, network layer, middleware layer and application layer [9].

The complex model of organism has inspired to ditribute computational and intelligent process to each level entity in the IoT infrastrucure to optimally conduct level computation [10]. There are two architectures reference available for IoT namely IoT-A and IIR-A [11]. In study describe the architecture from three perpective that is semantic orientation, internet orientation and things orentation.

The architecture above has become a reference for develop IoT architecture. IoT architecture growing exponentially like internet growth. In related to the issue, the group considered that current efforts regarding architecture models under development such as ITU-T model, NIST for smart Grid, M2M from ETSI, ARM from EU IoT-A [12].

B. Technology Enabler

The promise IoT is that the new technology trend will connect billion devices over the internet at 2020. Some ecosystems will be addressed, smart cities, smart home and other industrial applications. To meet this challenges required technology enabler to anticipate explosion of data and device, decreasing energy that operates intelligent device, miniaturisation device and autonomic resources [13].

Enabler technology alocated to encountered these problems can be seen from any perpective such as efficency energy device and storage, intellegence, communication, integration, interoperabilty, standards and manufacturing.
The one of problem in IoT is the most consuming energy when interconnect and comunicating among of "things". To evercome Radio Frequency (RF) solution used for a wide field of application in internet of things [14]. Several low power communication technology have been proposed are as follow [14]:

- **IEEE 802.15.4** has developed a low cost, low power consumtion, low complexity.
- **Bluetooth Low Energy (UWB)** technology is an emerging technology in the IoT domain that transmits signals across a much larger frequency range than conventional systems.
- **ISO 18000–7 DASH7** standard developed by DASH7 Alliance is a low power, low complexity, radio protocol for all sub 1GHz radio devices.
- **RFID/NFC** proposes a variety of standards to offer contactless solutions.

In addition to applied low power communication technology, ambient energy can also be used like mechanical energy, thermal energy, radiant energy and chemical energy. Technology Wireless Energy Harvesting (WEH) also enable for reduce power consumption when

WEH receives the transmitted radio waves with an antenna and converts the received RF energy into a stable direct current (DC) energy source to supply the sensor device [15]. Reduced hardware architecture system on chip targeting digital block can achieved reduction up to 24% of leakage power and 15% of dynamic power reduction over reference design [16].

The next problem is heterogeneity, hundreds of protocol communication have emerged to spesific requirements. Different technologies and protocols are interconected, some technologies were developed with IP capabilities, others used different networking technologies. Studied have been conducted with combines Service Control Networking (SCN) with cloud computing on IoT architecture, so that can help environmental scientists easily discover and manage data from various sensor [4]. Sofware Define Networking (SDN) also dramatically simplify network configuration and service management [17]. According to survey of 61 respondence from industry and academia suggested that heterogeneity in IoT technologies can be overcome by use of standardized protocols and semantic technologies for management of things and services [18].

The lack interoperability also important in IoT, it become crucial barrier among existing system wich will significantly increase complexity [19]. Interoperability is critical to ensure entities IP centric protocols and IoT spesific stack can work seamleslly with exixsting internet infrastructure. It is challenge in the IoT ecosystem and many solution has been addressed.

Interoperability must be addressed at the beginning of the development cycle [1], as silicon and software form the foundation of any system. It requires numerous combinations of worldwide equipment deployments, thousands of staff hours of testing, working relationships with operators and different equipment providers, and real world deployment experience to offer the highest levels of interoperability.

IoT world forum has been working on a common model to drive interoperability accross all IoT components that organizez these component into layers and provides all graphical representation of IoT depicted in Fig. 2.

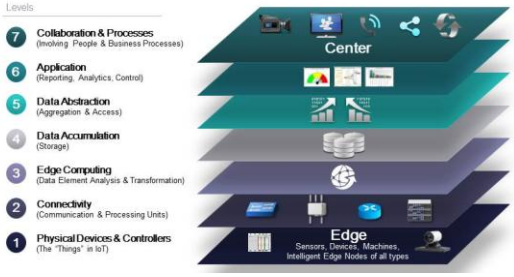

Figure 2. IoT World Forum Reference Model [22]

The next IoT enabler are Open Standards, that is key for success. By 2020, Gartner Group predict the agregated value and economic benefit of IoT exceed $19 trillion. This indicates hundreds of millions of internet-connected devices primarily use information that originated from devices, that is also known as machine-to-machine (M2M) communication. IoT has potential change the world, communication must take place on multiple levels, from the hardware that comprises the physical underpinnings of IoT (http://www.informationweek.com). However, IoT demans open standards.

Some open standards are issued by IoT working groups. The following is open standards that can be used, including:

- CoAP, ETSI SMART SmartM2M, MQTT or LwM2M provide open source implementations for IoT protocols.
- Heterogeneous System Architecture (HSA), is emerging as the next-generation industry standard that integrates different types of microprocessors and compute elements.

For a realistic implementation of IoT needed the technological platform as mentioned in [20], these technology are mostly: Radio Frequency Identification (RFID), Green Electronic (GE), Wireless Power Transfer (WPT) and Energy Harvesting (EH). In [8] addition to these technologies cloud computing, networking technologies (3G, 4G), Micro Electro Mechanical Systems (MEMS) technologies and optical technologies are available. As mentioned in [6], the following techologies are used in IoT, such as RFID/ Near Field Communication (NFC), internet protocol, electronic product code (EPC), barcode, wi-fi, bluetooth, zigbee, actuator, wireless sensor network (WSN) and artificial intelligence (AI).

The following [21] requirements common for IoT technology implementation, including:

- Sensing and data collection capability (sensing nodes).
- Layers of local embedded processing capability (local embedded processing nodes)..
- Wired and/or wireless communication capability (connectivity nodes).
- Software to automate task and enable new classes and services.
- Remote network/cloud-based embedded processing capability (remote embedded processing nodes)
- Full security accross the signal path

3. IOT USAGE

This section will be discussed some examples of the application of IoT technoligies. Smart Surfaces (SS), the applications of IoT that is placed on the floor surface to produce a map of footprints passers [20].

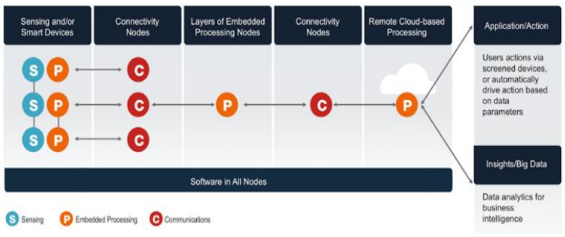

Figure 3. Functional View of IoT Technology [21]

4. DISCUSSION

IT technologies provide enormous opportunities to the industry. This needs to be the readiness of stakeholders, technology readiness and a shift in perspective. According to the survey conducted by Gartner, during the IOT implemented manpower will be reduced massively replaced by machines. Theses communicate with each other, household goods can be monitored and controlled through the Internet. This indicates that the number of devices connected to the Internet will increase exponentially and communicate with each other.

5. CONCLUSSION

From review about everything wich related to IoT can be concluded:

- IoT needs technology enabler such as efficency energy device and storage, intellegence, communication, integration, interoperabilty, standards and manufacturing.
- Developing of universal IoT architecture is important for IoT implementation in many industry
- Technology Wireless Energy Harvesting (WEH) also enable for reduce power consumption device and storage
- Open standard is key success that indicates hundreds of millions of internet-connected and communicate with each other

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